

Table 4.4-6
Screening of Shallow Subsurface Soils (0-5 feet) to Risk-Based Screening Criteria
SWMU Group C, Bayer New Martinsville

Constituent	CAS Number	Units	Frequency of Detection	Range of Detections	Sample of Maximum Detection	Range of Detection Limits	Sample of Maximum Detection Limit	Region III Industrial Soil RBC	Maximum Detection or Detection Limit Exceeds RBC
METALS									
Lead	7439-92-1	mg/kg	32 - 32	0.0121 J - 91.2	SM007-TB04-0001	NA		8.0E+02	No
PESTICIDES/HERBICIDES									
Heptachlor	76-44-8	mg/kg	0 - 28	NA		0.09 - 11.7	SM007-TB02-0305	1.3E+00	Max. D.L. >Ind RBC
SEMIVOLATILE ORGANIC COMPOUNDS									
2,4-Dinitrotoluene	121-14-2	mg/kg	8 - 28	0.25 - 1600	SM007-TB06-0001	0.24 - 10.6	SM007-TB02-0305	4.1E+03	No
2,4-Toluenediamine	95-80-7	mg/kg	5 - 28	1.3 - 75.9	SM007-TB06-0305	1.18 - 53.2	SM007-TB02-0305	1.8E+00	Max. Det. & D.L. > Ind RBC
2,6-Dinitrotoluene	606-20-2	mg/kg	5 - 28	0.2 - 380	SM007-TB06-0001	0.13 - 10.6	SM007-TB02-0305	2.0E+03	No
3,3'-Dichlorobenzidine	91-94-1	mg/kg	0 - 28	NA		0.28 - 64.9	SM007-TB02-0305	1.3E+01	Max. D.L. >Ind RBC
Azobenzene	103-33-3	mg/kg	0 - 28	NA		0.13 - 13	SM007-TB06-0001	5.2E+01	No
Benzidine	92-87-5	mg/kg	0 - 28	NA		1.5 - 170	SM007-TB02-0305	2.5E-02	Max. D.L. >Ind RBC
Benzo(a)anthracene	56-55-3	mg/kg	0 - 28	NA		0.13 - 13.8	SM007-TB02-0305	7.8E+00	Max. D.L. >Ind RBC
Benzo(a)pyrene	50-32-8	mg/kg	0 - 28	NA		0.13 - 13	SM007-TB06-0001	7.8E-01	Max. D.L. >Ind RBC
Benzo(b)fluoranthene	205-99-2	mg/kg	0 - 28	NA		0.1 - 11	SM007-TB06-0001	7.8E+00	Max. D.L. >Ind RBC
Benzo(k)fluoranthene	207-08-9	mg/kg	0 - 28	NA		0.14 - 15	SM007-TB06-0001	7.8E+01	No
bis(2-Chloroethyl)ether	111-44-4	mg/kg	0 - 28	NA		0.1 - 11	SM007-TB06-0001	5.2E+00	Max. D.L. >Ind RBC
bis(2-Chloroisopropyl)ether	108-60-1	mg/kg	0 - 28	NA		0.1 - 11	SM007-TB06-0001	8.2E+01	No
Carbazole	86-74-8	mg/kg	0 - 28	NA		0.08 - 53.2	SM007-TB02-0305	2.9E+02	No
Dibenz(a,h)anthracene	53-70-3	mg/kg	0 - 28	NA		0.15 - 16	SM007-TB06-0001	7.8E-01	Max. D.L. >Ind RBC
Hexachlorobenzene	118-74-1	mg/kg	0 - 28	NA		0.16 - 17	SM007-TB06-0001	3.6E+00	Max. D.L. >Ind RBC
Hexachlorobutadiene	87-68-3	mg/kg	0 - 28	NA		0.1 - 11	SM007-TB06-0001	7.3E+01	No
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0 - 28	NA		0.16 - 17	SM007-TB06-0001	7.8E+00	Max. D.L. >Ind RBC
m-toluidine	108-44-1	mg/kg	0 - 28	NA		0.09 - 21.3	SM007-TB02-0305	3.0E+01	No
N-nitrosodibutylamine	924-16-3	mg/kg	0 - 28	NA		0.14 - 15	SM007-TB06-0001	1.1E+00	Max. D.L. >Ind RBC
N-Nitrosodimethylamine	62-75-9	mg/kg	0 - 28	NA		0.1 - 11	SM007-TB06-0001	1.1E-01	Max. D.L. >Ind RBC
n-Nitroso-di-n-propylamine	621-64-7	mg/kg	0 - 28	NA		0.1 - 11	SM007-TB06-0001	8.2E-01	Max. D.L. >Ind RBC
o,p-toluidine	106-49-0	mg/kg	4 - 28	0.11 - 26	SM007-TB06-0001	1.2 - 54.2	SM007-TB02-0305	3.0E+01	Max. D.L. >Ind RBC
Pentachloronitrobenzene	82-68-8	mg/kg	0 - 28	NA		0.08 - 10.6	SM007-TB02-0305	2.2E+01	No
Pentachlorophenol	87-86-5	mg/kg	0 - 28	NA		0.24 - 31	SM007-TB06-0001	4.8E+01	No
VOLATILE ORGANIC COMPOUNDS									
1,2,3-Trichloropropane	96-18-4	mg/kg	0 - 32	NA		0.134 - 1.06	SM007-TB06-0001	8.2E-01	Max. D.L. >Ind RBC
1,2-Dibromo-3-chloropropane	96-12-8	mg/kg	0 - 32	NA		0.257 - 2.11	SM007-TB06-0001	4.1E+00	No
1,2-Dibromooethane	106-93-4	mg/kg	0 - 32	NA		0.134 - 1.06	SM007-TB06-0001	6.7E-02	Max. D.L. >Ind RBC
Acrylonitrile	107-13-1	mg/kg	0 - 32	NA		1.34 - 10.6	SM007-TB06-0001	1.1E+01	No
Benzene	71-43-2	mg/kg	6 - 32	0.138 J - 10.4 J	SM008-TB01-0305	0.134 - 1.06	SM007-TB06-0001	2.0E+02	No
Vinyl Chloride	75-01-4	mg/kg	0 - 32	NA		0.257 - 2.11	SM007-TB06-0001	3.0E+00	No

¹ Region III Industrial RBCs for Soil (USEPA, Region III, 1999)

NOTE: Only those constituents whose detected concentration or detection limit exceeded the Industrial Soil RBC in the Total Soils Screening are presented here.

Table 4.4-5
Screening of Surface Soils (0-2 feet) to Risk-Based Screening Criteria
SWMU Group C, Bayer New Martinsville

Constituent	CAS Number	Units	Frequency of Detection	Range of Detections	Sample of Maximum Detection	Range of Detection Limits	Sample of Maximum Detection Limit	Region III Industrial Soil RBC ¹	Maximum Detection or Detection Limit Exceeds RBC
METALS									
Lead	7439-92-1	mg/kg	16 - 16	0.0116 - 91.2	SM007-TB04-0001	NA		4.0E+02	No
PESTICIDES/HERBICIDES									
Heptachlor	76-44-8	mg/kg	0 - 16	NA		0.09 - 9.8	SM007-TB06-0001	1.3E+00	Max. D.L. >Ind RBC
SEMIVOLATILE ORGANIC COMPOUNDS									
2,4-Dinitrotoluene	121-14-2	mg/kg	4 - 16	0.37 - 1600	SM007-TB06-0001	2.06 - 2.24	SM007-TB08-0001	4.1E+03	No
2,4-Toluenediamine	95-80-7	mg/kg	3 - 16	1.3 - 69.6	SM007-TB10-0001	3.6 - 11.2	SM007-TB08-0001	1.8E+00	Max. Det. & D.L. > Ind RBC
2,6-Dinitrotoluene	606-20-2	mg/kg	3 - 16	0.2 - 380	SM007-TB06-0001	0.13 - 2.24	SM007-TB08-0001	2.0E+03	No
3,3'-Dichlorobenzidine	91-94-1	mg/kg	0 - 16	NA		0.28 - 29	SM007-TB06-0001	1.3E+01	Max. D.L. >Ind RBC
Azobenzene	103-33-3	mg/kg	0 - 16	NA		0.13 - 13	SM007-TB06-0001	5.2E+01	No
Benidine	92-87-5	mg/kg	0 - 16	NA		1.5 - 160	SM007-TB06-0001	2.5E-02	Max. D.L. >Ind RBC
Benzo(a)anthracene	56-55-3	mg/kg	0 - 16	NA		0.13 - 13	SM007-TB06-0001	7.8E+00	Max. D.L. >Ind RBC
Benzo(a)pyrene	50-32-8	mg/kg	0 - 16	NA		0.13 - 13	SM007-TB06-0001	7.8E-01	Max. D.L. >Ind RBC
Benzo(b)fluoranthene	205-99-2	mg/kg	0 - 16	NA		0.1 - 11	SM007-TB06-0001	7.8E+00	Max. D.L. >Ind RBC
Benzo(k)fluoranthene	207-08-9	mg/kg	0 - 16	NA		0.14 - 15	SM007-TB06-0001	7.8E+01	No
bis(2-Chloroethyl)ether	111-44-4	mg/kg	0 - 16	NA		0.1 - 11	SM007-TB06-0001	5.2E+00	Max. D.L. >Ind RBC
bis(2-Chloroisopropyl)ether	108-60-1	mg/kg	0 - 16	NA		0.1 - 11	SM007-TB06-0001	8.2E+01	No
Carbazole	86-74-8	mg/kg	0 - 16	NA		0.08 - 11.2	SM007-TB08-0001	2.9E+02	No
Dibenz(a,h)anthracene	53-70-3	mg/kg	0 - 16	NA		0.15 - 16	SM007-TB06-0001	7.8E-01	Max. D.L. >Ind RBC
Hexachlorobenzene	118-74-1	mg/kg	0 - 16	NA		0.16 - 17	SM007-TB06-0001	3.6E+00	Max. D.L. >Ind RBC
Hexachlorobutadiene	87-68-3	mg/kg	0 - 16	NA		0.1 - 11	SM007-TB06-0001	7.3E+01	No
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0 - 16	NA		0.16 - 17	SM007-TB06-0001	7.8E+00	Max. D.L. >Ind RBC
m-toluidine	108-44-1	mg/kg	0 - 16	NA		0.09 - 9.8	SM007-TB06-0001	3.0E+01	No
N-nitrosodibutylamine	924-16-3	mg/kg	0 - 16	NA		0.14 - 15	SM007-TB06-0001	1.1E+00	Max. D.L. >Ind RBC
N-Nitrosodimethylamine	62-75-9	mg/kg	0 - 16	NA		0.1 - 11	SM007-TB06-0001	1.1E-01	Max. D.L. >Ind RBC
n-Nitroso-di-n-propylamine	621-64-7	mg/kg	0 - 16	NA		0.1 - 11	SM007-TB06-0001	8.2E-01	Max. D.L. >Ind RBC
o,p-toluidine	106-49-0	mg/kg	3 - 16	0.11 - 26	SM007-TB06-0001	10.5 - 11.5	SM007-TB08-0001	3.0E+01	No
Pentachloronitrobenzene	82-68-8	mg/kg	0 - 16	NA		0.08 - 8.5	SM007-TB06-0001	2.2E+01	No
Pentachlorophenol	87-86-5	mg/kg	0 - 16	NA		0.29 - 31	SM007-TB06-0001	4.8E+01	No
VOLATILE ORGANIC COMPOUNDS									
1,2,3-Trichloropropane	96-18-4	mg/kg	0 - 16	NA		0.134 - 1.06	SM007-TB06-0001	8.2E-01	Max. D.L. >Ind RBC
1,2-Dibromo-3-chloropropane	96-12-8	mg/kg	0 - 16	NA		0.257 - 2.11	SM007-TB06-0001	4.1E+00	No
1,2-Dibromoethane	106-93-4	mg/kg	0 - 16	NA		0.134 - 1.06	SM007-TB06-0001	6.7E-02	Max. D.L. >Ind RBC
Acrylonitrile	107-13-1	mg/kg	0 - 16	NA		1.34 - 10.6	SM007-TB06-0001	1.1E+01	No
Benzene	71-43-2	mg/kg	3 - 16	0.212 J - 1.88 J	SM008-TB01-0001	0.134 - 1.06	SM007-TB06-0001	2.0E+02	No
Vinyl Chloride	75-01-4	mg/kg	0 - 16	NA		0.257 - 2.11	SM007-TB06-0001	3.0E+00	No

¹ Region III Industrial RBCs for Soil (USEPA, Region III, 1999)

NOTE: Only those constituents whose detected concentration or detection limit exceeded the Industrial Soil RBC in the Total Soils Screening are presented here.

the samples which exceeded the industrial RBC for 2,4-TDA consisted predominantly of TDI residue, a visually distinctive material. Because constituents exceed the industrial RBCs, Bayer will include this SWMU Group in the facility's institutional control plan for worker safety while performing subsurface work.

Based on the SSL screening, there is a potential for constituents to leach to groundwater at potentially unacceptable concentrations. Bayer performs quarterly groundwater monitoring in accordance with a USEPA-approved groundwater monitoring plan. The objective of the groundwater monitoring plan is to ensure that potentially impacted groundwater is captured by on-site recovery wells. The groundwater monitoring has been performed at the facility since 1986 and has consistently shown on-site capture of groundwater by the site's pumping wells.

Although no further action is recommended for SWMU Group C based on the exposure assessment, the potential for constituents to leach to groundwater is a potential concern. Therefore, SWMU Group C will be evaluated as a potential source area for constituents identified in groundwater and further action, if necessary, at this SWMU will be evaluated as part of a CMS for groundwater.

23.9 mg/kg in 0-5 foot soils. These distributions were assumed to be lognormal as the data distributions were undefined. These concentrations were calculated using the equations in Section 3.2.3 and appropriate exposure parameters for the receptors evaluated.

4.4.3.4 Exposure Risk Assessment Results

Table 4.4-9 provides a summary of the theoretical excess lifetime cancer risks for the industrial worker and construction worker receptors. Non-cancer hazard indices were not calculated as the COI identified is not considered to have non-carcinogenic effects. The total cancer risks for these two receptors are 1.9×10^{-5} and are 3.8×10^{-6} , which are within the acceptable range of 1×10^{-4} to 1×10^{-6} for human health risk established by the USEPA. Given that these risks are acceptable, no refined receptor evaluation was necessary, as discussed in Section 3.2.3.

4.4.4 Discussions with USEPA

SWMUs 7, 8, 9, and 11 were discussed with USEPA on April 4, 1999. During this discussion, it was concluded that these units should be grouped into a SWMU C because SWMU 7 completely surrounds the other units and that this group would require additional investigation during Phase 3 of the RFI. USEPA agreed that resampling was not necessary for SM007-TB01, -TB04, -TB11, or SM008-TB01. However, resampling for the 0 to 1 ft-bgs interval in SM007-TB06, -TB07 and -TB08 is required. USEPA also agreed to all of the proposed soil boring locations for this SWMU Group presented in the Phase 2 report.

SWMU Group C was discussed with USEPA on August 14, 2000, after the initial submission of the Final RFI Report. A surface condition map was completed based on our discussion (Figure 4.4-2). This map shows that most of this SWMU group is either covered with gravel or asphalt and that soil is generally not exposed. USEPA indicated that they generally agree with the conclusions presented in the Final RFI; 1) no further action based on exposure risk, 2) further evaluation as a potential source area in the groundwater CMS, and 2) inclusion in the facility's institutional control plan covering subsurface work.

4.4.5 Conclusions and Recommendations

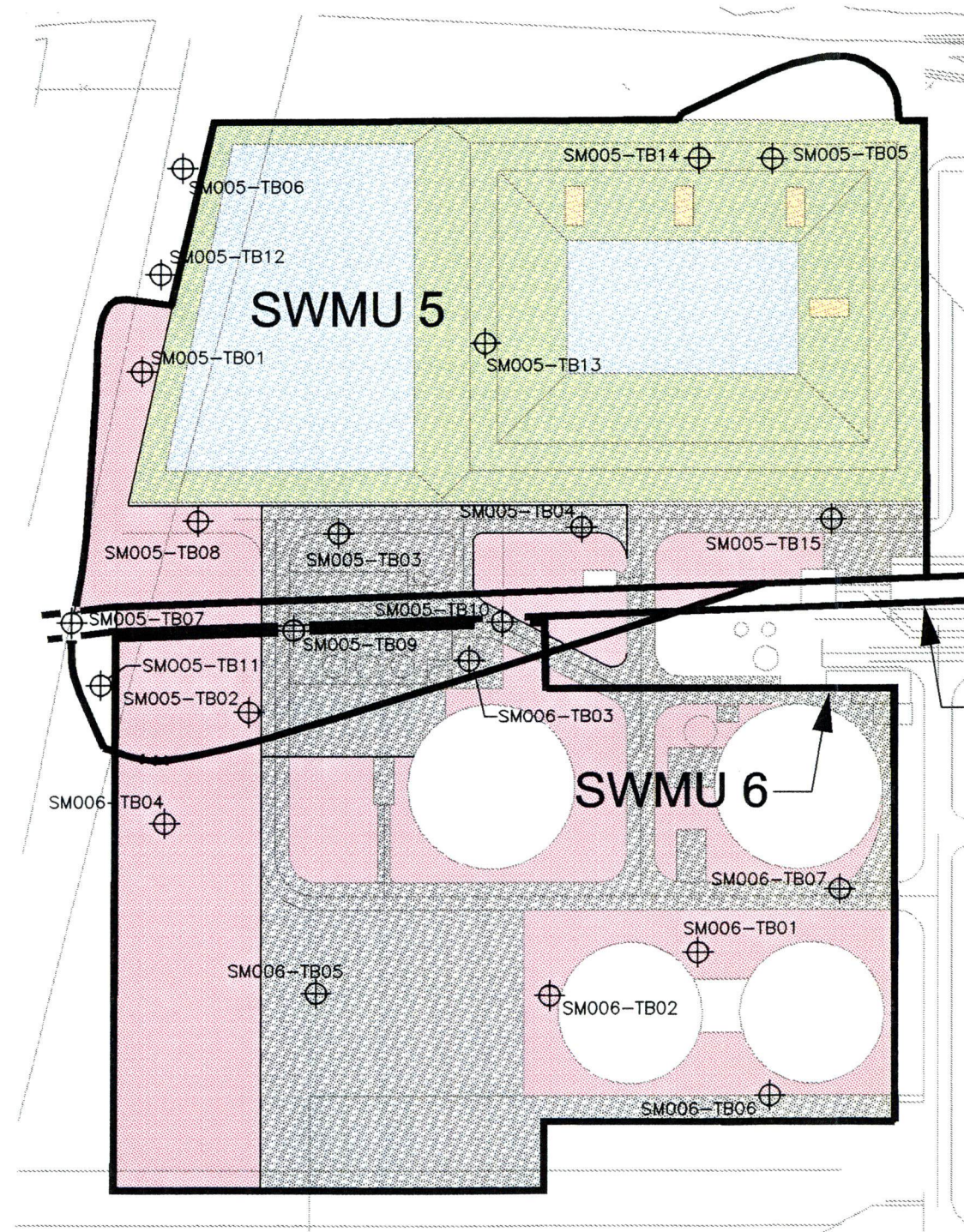
Based on the exposure risk assessment results, no further action is warranted at SWMU Group C. This conclusion is based on the calculated risks for industrial and construction worker scenarios are within the acceptable range defined by USEPA. Additionally, only one constituent (2,4-TDA) exceeded the USEPA Region III industrial RBCs in shallow soil (0-2 and 0-5 ft-bgs). All

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Shading has been removed from Tables to make more legible.

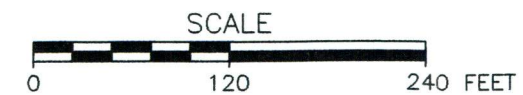
Section 4.4.4 Discussions with USEPA have been updated.

Figure 4.4-2 Added figure showing surface conditions in the SWMU C area



LEGEND:

	GRAVEL
	WATER
	CONCRETE
	ASPHALT
	DIRT/SOIL

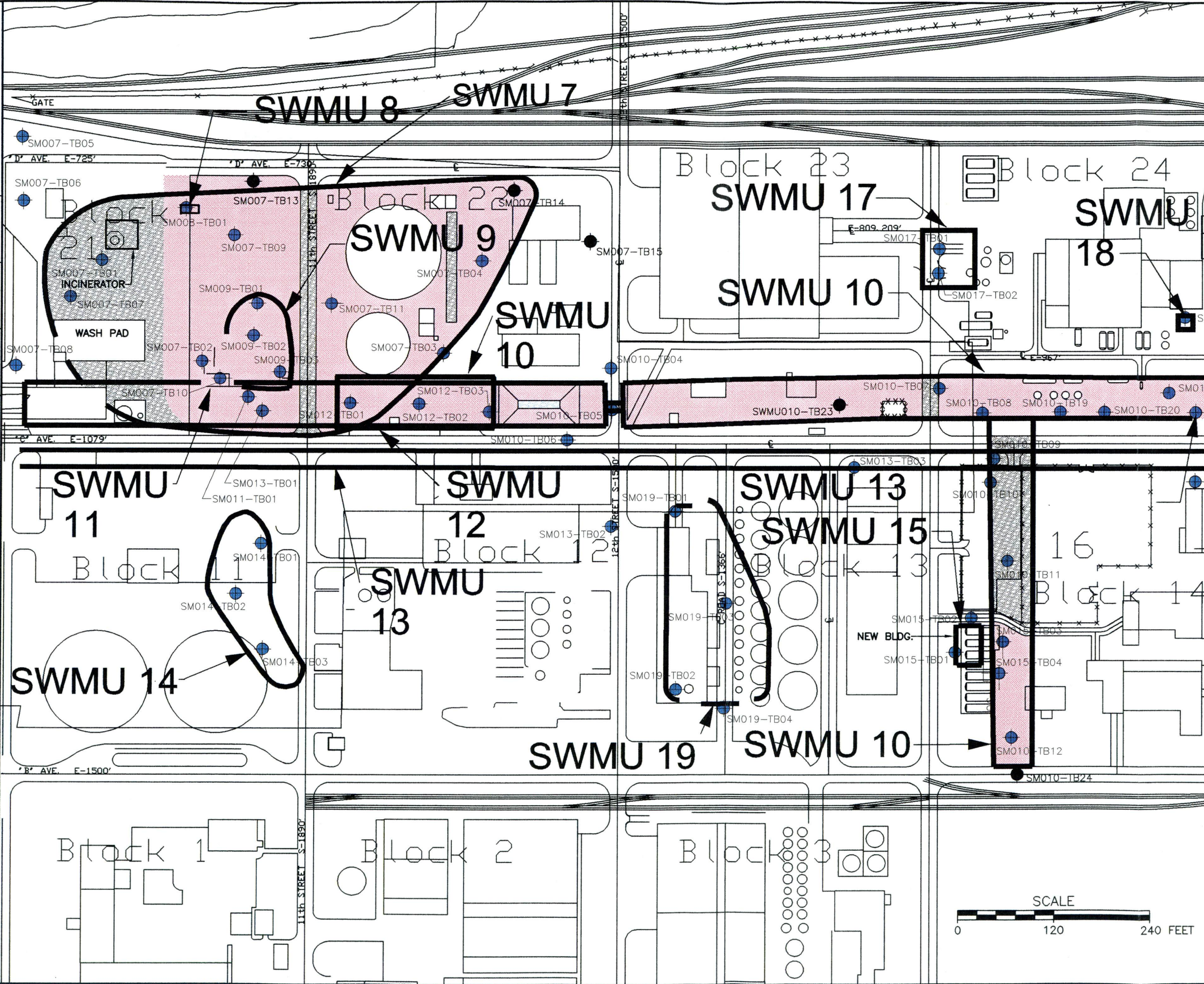


BAYER NEW MARTINSVILLE
NEW MARTINSVILLE, WEST VIRGINIA

FIGURE 4.3-2
SURFACE CONDITIONS
FOR SWMU GROUP B
(SWMUs 5 AND 6)
BAYER, NEW MARTINSVILLE

DRAWING NUMBER 800588-B40
APPROVED BY
CHECKED BY
DRAWN BY B. Snyder
OFFICE Pittsburgh, PA

U:\project\000000\000000\000000-B40.dwg
Plot Date/Time: 02/14/01 03:02pm
Format Revised: 12/15/99



LEGEND:

	GRAVEL
	WATER
	ASPHALT

	BAYER NEW MARTINSVILLE NEW MARTINSVILLE, WEST VIRGINIA
	FIGURE 4.4-2 SURFACE CONDITIONS SOUTHERN SECTION OF PLANT
	BAYER, NEW MARTINSVILLE

SWMU GROUP D

Section 4.5.4

Discussions with USEPA have been updated

Section 4.5.5

Statement added to indicate that SWMU Group will be included in soil management plan.

of 1. Given that these risks and hazards are acceptable, no refined receptor evaluation was necessary, as discussed in Section 3.2.3.

4.5.4 Discussions with USEPA

~~Bayer discussed with USEPA the appropriate course of action for SWMUs 10, including SWMUs 12 and 16, and 15 after the submittal of the Phase 2. SWMUs 10 and 15 were discussed on May 19 and March 24, 1999, respectively. The discussions concerning SWMU 15 indicated that this SWMU should be placed in the no further action category. However, this decision was based on including one boring (SM015-TB03) as part of SWMU 10 and not as part of SWMU 15. Further review of the data and boring locations indicated that the results from SWMU 15 should be considered as part of SWMU 10, resulting in the formation of SWMU Group D. Discussions of SWMU 10 indicated that this SWMU should be evaluated further and resulted in the Phase 3 sampling program. USEPA agreed that resampling was necessary only for locations SM010-TB01 (0-1 and 3-5 ft-bgs), TB04 (3-5 ft-bgs), TB05 (3-5 and 7-9 ft-bgs), TB06 (3-5 and 7-9 ft-bgs), TB10 (0-1 ft-bgs, metals only), SM012-TB01 (0-1, 3-5, and 7-9 ft-bgs) and TB02 (9-13 ft-bgs). USEPA also agreed to the proposed borings for SWMU 10 presented in the Phase 2 report.~~

SWMU Group D was discussed with USEPA on March 24, 1999, May 19, 1999, and August 25 2000. The March 24 and May 19, 1999 discussions were completed after submittal of the Phase 2 Report and resulted in SWMUs 10, 12, 15, and 16 being grouped into SWMU Group D. The discussions indicated that SWMU Group D should be evaluated further and resulted in the Phase 3 sampling program. USEPA agreed that resampling was necessary only for the following locations: SM010-TB01 (0-1 and 3-5 ft-bgs), - TBO4 (3-5 ft-bgs), - TBO5 (3-5 and 7-9 ft bgs), -TB06 (3-5 and 7-9), - TB10 (0-1 ft-bgs, metals only), SM012-TB01 (0-1, 3-5, and 7-9 ft bgs) and -TB02 (9-13 ft. bgs).

The August 25, 2000 discussion of SWMU Group D was conducted after the initial submittal of the Final RFI Report. During this discussion USEPA agreed with the conclusions and recommendations presented; however, USEPA requested that SWMU Group D also be included in a soil management plan as a source reduction measure.

Based on the Final RFI report and the subsequent discussions, USEPA concurred with the conclusion and recommendations for SWMU Group D presented in Section 4.5.5:) no further action based on exposure risk, 2) inclusion in the facility's institutional control plan covering subsurface work, and 3) further evaluation as a potential source area during the completion of the

sitewide groundwater CMS. As recommended by USEPA, SWMU Group D will also be listed as a soil management area in the institutional control plan as part of a source reduction strategy. More specifically, soils excavated as part of routine construction work within the soil management area be tested and disposed as appropriate.

4.5.5 Conclusions and Recommendations

Based on the exposure risk assessment results, no further action is warranted at SWMU Group D. This conclusion is based on the calculated risks for industrial and construction worker scenarios are within the acceptable range defined by USEPA. Additionally, no constituents exceeded the USEPA Region III industrial RBCs in surface soil (0-2 ft-bgs). Four constituents exceeded the (2,4-toluenediamine, o,p-toluidine, m-toluidine, benzene, and aniline exceeded the USEPA Region III industrial RBCs in shallow soil (0-5 ft-bgs); however, the detailed risk assessment indicated that the risks under the excavation/construction worker scenario is within the acceptable range as defined by USEPA. However because several constituents exceed the industrial RBCs, Bayer will include SWMU Group D in the facility's institutional control plan for worker safety while performing subsurface work. Additionally, SWMU Group D will also be subject to a soil management plan as recommended for source control during discussions with USEPA.

Three inorganics (cadmium, chromium, and nickel) and twelve organics (1,1-dichloroethene, benzene, chlorobenzene, methylene, toluene, trichloroethene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, bis(2-chloroethyl)ether, nitrobenzene, and p-chloraniline) exceeded the site-specific SSLs. Comparison of maximum detected values to the site-specific SSLs indicates a potential for constituents to leach to groundwater at potentially unacceptable concentrations. Bayer performs quarterly groundwater monitoring in accordance with a USEPA-approved groundwater monitoring plan. The objective of the groundwater monitoring plan is to ensure that potentially impacted groundwater is captured by on-site recovery wells. The groundwater monitoring has been performed at the facility since 1986 and has consistently shown on-site capture of groundwater by the site's pumping wells.

Although no further action is recommended for SWMU D based on the exposure assessment, the potential for constituents to leach to groundwater is a potential concern. Therefore, SWMU D will be evaluated as a potential source area for constituents in groundwater and further action, if necessary, will be evaluated as part of a CMS for groundwater.

SWMU 21

Figure 4.12-1

Corrected analytical boxes to indicate correct sample location.

Section 4.12.2

Removed next to last sentence in first paragraph, incorrect statement.

Section 4.12.3.1

Corrected industrial to residential at the end of first sentence.

4.12.1.2 Phase 2 Scope of Work

The scope of work for Phase 2 was defined on the findings of the previous investigation work. Two test borings were installed at SWMU 21 for the purpose of collecting samples for laboratory and geotechnical analysis.

Borings SM021-TB01 and SM021-TB02 were both drilled to 21 ft-bgs. Samples for laboratory analysis were collected from each boring at the surface (0 to 1 ft-bgs), the shallow subsurface (3 to 5 ft-bgs), and the 2-foot interval above the alluvial aquifer (18.3 to 20.3 ft-bgs). Additional samples were taken from SM021-TB01 in the 2-foot interval above a perched water zone and from SM021-TB02 in areas with elevated OVM readings and/or visual contamination.

A sample was collected from SM021-TB01 in the 10.6 to 12.6 ft-bgs interval above a perched water zone. This interval also had slightly elevated OVM readings (9.9 ppm). Samples were collected from SM021-TB02 in the 7 to 9 ft-bgs interval due to elevated OVM readings (198 ppm) and in the 10.7 to 13.7 ft-bgs interval due to both elevated OVM readings (338 ppm) and perched water at 15.2 ft-bgs. The samples were submitted for analysis of SVOCs, metals, VOCs, and TOCs. Table 4.12-1 presents the complete soil analytical results for SWMU 21 and Figure 4.12-1 provides selected soil analytical results on a plan view map.

Shelby Tube samples for geotechnical analysis were collected from a twin boring drilled beside SM021-TB01. The samples were taken from the 1 to 3 ft-bgs interval (sieve, hydrometer, and bulk density analyses), and also the 3 to 5 and 10 to 12 ft-bgs intervals (sieve, hydrometer, bulk density, moisture content, and permeability analyses).

4.12.2 Field Observations

The boring logs for SWMU 21 (Appendix D) indicate that subsurface materials encountered at SWMU IT E are 2.5-feet of sand and gravel fill material above mixtures of clay, silt, sand, and gravel to 19.5 ft-bgs, and fine to medium sand at depth. ~~TDI residue and ash was identified in some borings at depths of less than 0.5 feet.~~ Table 4.12-2 provides a summary of field observations.

Perched water was found extending from 12.6 to approximately 13 ft-bgs in a zone of sandy clay containing few fine to medium gravel in boring SM021-TB01. The alluvial aquifer was reached at approximately 20.3 ft-bgs in boring SM021-TB01. Perched water was found in boring

SM021-TB02 extending from 15.2 to approximately 16.4 ft-bgs in a zone of clayey silt containing a trace of fine sand. The alluvial aquifer was also reached at approximately 20.3 ft-bgs in boring SM021-TB02.

4.12.3 Risk Assessment Results

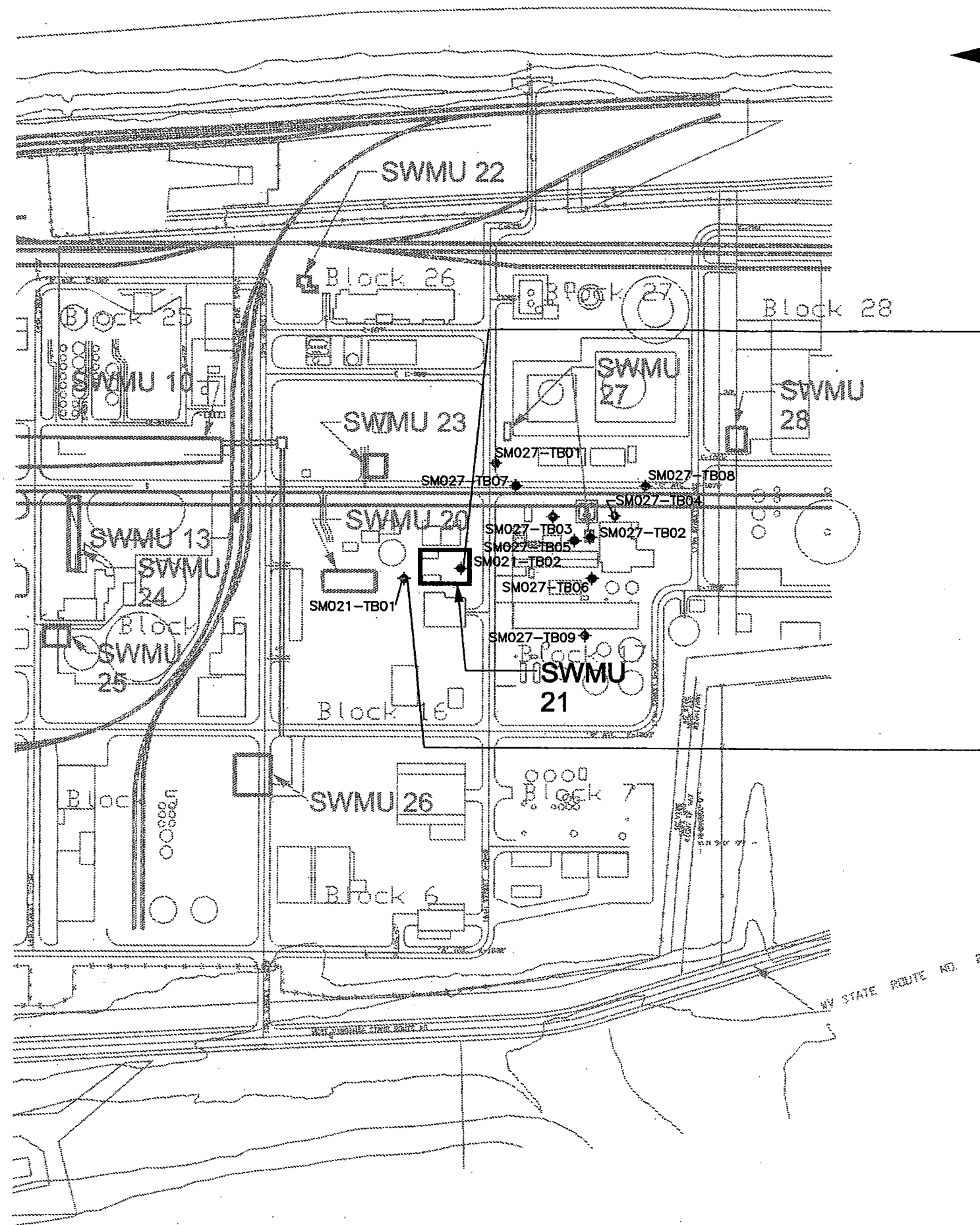
Table 4.12-1 provides complete analytical results for SWMU 21. Table 4.12-3 and Table 4.12-4 present risk screening summaries for all soil samples collected at SWMU 21. The screening tables identify constituents with detections and/or detection limits exceeding either the Region III industrial and residential RBCs or the USEPA SSLs. The maximum detected concentrations, the maximum detection limits, the frequency of detection, and a comparison of the detected concentrations and detection limits to the screening criteria are also presented in Tables 4.12-3 and Table 4.12-4.

4.12.3.1 Comparison to Risk Based Criteria

As indicated on Table 4.14-3, there is one organic constituent with a maximum detected concentration that exceeded its Region III RBCs for industrial soil and seventeen organics with maximum detection limits exceeding the Region III RBCs for ~~industrial~~-residential soil. Additionally, there are seven organics with maximum detected concentrations exceeding the Region III RBCs for residential soil and thirty organics with maximum detection limits exceeding the Region III RBCs for residential soil.

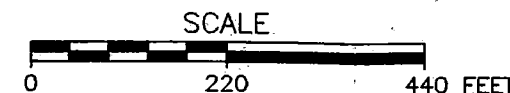
USEPA SSLs were compared to maximum detected concentrations and maximum detection limits in soils at all depths in Table 4.12-4. As indicated on the table, there are six organics with maximum detected concentrations exceeding the USEPA SSLs. Additionally, there are thirty-eight organics with maximum detection limits exceeding the USEPA SSLs. All constituents whose maximum detected concentrations exceed the USEPA SSL were evaluated further in a comparison to site-specific SSLs. This comparison is discussed in Section 4.12.3.2.

All constituents whose maximum detected concentrations or maximum detection limits that exceed the Region III RBC for industrial soil were evaluated separately in the screening risk-assessments for the 0-2 feet and the 0-5 feet soil depth intervals. These screening assessments are discussed below and are presented in Tables 4.12-5 and 4.12-6, respectively.



SAMPLE ID	SM021-TB02-0001	SM021-TB02-0305	SM021-TB02-0709	SM021-TB02-1013	SM021-TB02-1820
SAMPLE DEPTH(R)	0.00-1.00	3.00-5.00	7.00-9.00	10.00-13.00	18.00-20.00
SAMPLE LOCATION	TB02	TB02	TB02	TB02	TB02
SAMPLE DATE	7/10/97	7/10/97	7/10/97	7/10/97	7/10/97
PARAMETER					
Volatiles (µg/kg)					
Benzene	< 138	350 J	1500	6480	42500
Freon 113	574 J	491 J	< 312	< 318	1100 JB
Toluene	< 138 J	< 152 J	289 J	4070	24800
Semivolatiles (µg/kg)					
1-Methylnaphthalene	< 2000	480	< 200	< 10000	< 20000
2,4-Dinitrotoluene	174000	1020	8620	407000	650000
2,4-Toluenediamine	10100	< 2000	< 1000	< 50000	< 100000
2,6-Dinitrotoluene	15300	13800	1790	82400	124000
2-Methylnaphthalene	< 2000	600	< 200	< 10000	< 20000
5-Nitro-o-toluidine	< 2000	1240	700	< 10000	84200
Bis(2-ethylhexyl) phthalate	< 2400	< 480	269 B	< 12000	< 24000
Bisphenol A	< 3800	860	< 360	< 18000	< 36000
Di-n-butyl phthalate	< 2000	640 B	760 B	< 10000	< 20000
Nitrobenzene	< 2000	440	14400	376000	588000
m-Nitrotoluene	< 2000	< 400	670	13600	20400
o-Nitrotoluene	2940	< 400	6860	187000	258000
p-Chloroaniline	2180	< 400	< 200	< 10000	< 20000
p-Nitrotoluene	< 3000	< 800	6380	139000	212000
Metals (µg/kg)					
Cadmium	890	1060	560	660	610
Chromium	15800	22800	16500	15000	12400
Lead	24900	15800	11500	12500	9780
Nickel	55000	21000	18800	17800	14800

SAMPLE ID	SM021-TB01-0001	SM021-TB01-0305	SM021-TB01-1012	SM021-TB01-1820
SAMPLE DEPTH(R)	0.00-1.00	3.00-5.00	10.00-12.00	18.00-20.00
SAMPLE LOCATION	TB01	TB01	TB01	TB01
SAMPLE DATE	7/10/97	7/10/97	7/10/97	7/10/97
PARAMETER				
Volatiles (µg/kg)				
Benzene	< 143	< 169	958	64200
Freon 113	< 275	328 J	1690	< 349
Toluene	< 143 J	< 169 J	932 J	68400 J
Semivolatiles (µg/kg)				
2,4-Dinitrotoluene	908000	R	30600	222000
2,4-Toluenediamine	86200	R	< 1000	< 1000
2,6-Dinitrotoluene	78900	R	6300	60700
5-Nitro-o-toluidine	< 10000	R	930	74000
Aniline	< 14000	R	< 280	22800
Di-n-butyl phthalate	< 10000	R	< 200	630 B
Nitrobenzene	< 10000	R	10900	173000
m-Nitrotoluene	< 10000	R	680	15800
m-Toluidine	< 20000	R	< 400	820
o,p-Toluidine	< 51000	R	< 1020	8880
o-Nitrotoluene	< 10000	R	6900	116000
p-Nitrotoluene	< 15000	R	7000	119000
Metals (µg/kg)				
Cadmium	1130	640	960	630
Chromium	21400	15700	14300	12900
Lead	16800	12800	11400	10100
Nickel	29100	17800	20400	12600



BAYER NEW MARTINSVILLE
NEW MARTINSVILLE, WEST VIRGINIA

FIGURE 4.12-1
SOIL BORING LOCATIONS WITH ANALYTICAL
RESULTS FOR SWMU 21
RCRA FACILITY INVESTIGATION
BAYER, NEW MARTINSVILLE

4.18.3.3 Conclusions and Recommendations

Since there are no COIs for SWMU 27, based on the screening process previously described, the potential risks to onsite receptors did not require quantification. As a result, no further action is recommended at SWMU 27.

4.18.4 Discussions with USEPA

Bayer and USEPA discussed the appropriate action for SWMU 27 on April 21, 1999 and August 17, 2000. As a result of the April 21, 1999 discussion, the portion of SWMU 27 located in Block 27 was dropped from further evaluation based on the Phase 2 results. However, it was decided that further evaluation was warranted for the remaining portion of SWMU 27 during Phase 3. Further discussion resulted in the derivation of the Phase 3 scope of work.

The August 17, 2000 discussion took place after the initial submittal of the Final RFI Report. USEPA concurred with the recommendations presented in Section 4.18.5: 1) no further action based on the exposure risk; and 2) further evaluation during the sitewide groundwater CMS as a potential source area for constituents identified in groundwater.

4.18.5 Conclusions and Recommendations

Based on the exposure risk assessment, no further action is warranted at SWMU 27. This conclusion is based on the calculated risks for industrial and construction worker scenarios which are within the acceptable range defined by USEPA since the constituents detected in shallow soil samples (0-5 ft-bgs) did not exceed the USEPA Region III industrial RBCs.

Five organics (methylene chloride, 2,4-dinitrotoluene, 2,6-dinitrotoluene, bis(2-chloroethyl)ether and nitrobenzene) exceeded the site-specific SSLs, indicating a potential for constituents to leach to groundwater at potentially unacceptable concentrations. Bayer performs quarterly groundwater monitoring in accordance with a USEPA-approved groundwater monitoring plan. The objective of the groundwater monitoring plan is to ensure that potentially impacted groundwater is captured by on-site recovery wells. The groundwater monitoring has been performed at the facility since 1986 and has consistently shown on-site capture of groundwater by the site's pumping wells.

Although the exposure assessment indicates that no further action is warranted at SWMU 27, constituents are present at concentrations exceeding the site-specific SSL indicating a potential to

SWMU 30

Section 4.21.4

Updated discussions with USEPA.

Section 4.21.5

Updated conclusions/recommendation to address items discussed with USEPA.

4.21.3.3 Site Specific Analysis

The above results indicate that no further action is necessary for SWMU 30. The reasons for assigning this SWMU to the NFA category include:

- Only one detected constituent (2,4-toluenediamine) exceeded the industrial RBC. This constituent was detected in only two of 14 samples, at depths of 2-4 and 3-5 ft-bgs. None of the detection limits of the other samples exceeded the industrial RBC.
- Two constituents (methylene chloride) had maximum detected concentrations that exceeded the site-specific SSL. However, in the four samples where methylene chloride was detected, each result was qualified with a "B", indicating the presence of blank contamination. Methylene chloride is known to be a common blank contaminant. Additionally, the maximum detected concentration of 0.7 mg/kg is only slightly above the site-specific SSL of 0.39 mg/kg.
- While the detection limits of some constituents exceed the site-specific SSLs, none of these constituents were ever detected. Each of these constituents had site-specific SSLs less than 0.20 mg/kg and had detection limits for soils that always exceed the respective site-specific SSLs. Also, none of these constituents had detection limits that were significantly above the method detection limits. Therefore, these detection limits are considered reasonable, are not elevated, and are unlikely to mask significant concentrations of constituents.
- While the detection limits of several constituents exceed the industrial RBCs, none of these constituents were ever detected, and all have detection limits that are comparable to their method detection limits. Also, these constituents have industrial RBCs that are 0.11 mg/kg or less, and the detection limits always exceed the respective industrial RBCs. Therefore, these detection limits are considered reasonable, are not elevated, and are unlikely to mask significant concentrations of constituents.

4.21.4 Discussions with USEPA

~~Bayer discussed the Phase 2 analytical results and the appropriate course of action for SWMU 30 with USEPA on March 24, 1999. USEPA concurred with Bayer that no further action is required at this SWMU, pending inclusion of this area in an institutional control plan for protection of workers while excavating based on the 2,4-toluenediamine identified in subsurface samples. Additionally, it was agreed that four discrete samples were to be collected during Phase 3 and analyzed for 2,4-toluenediamine only.~~

Bayer discussed SWMU 30 with USEPA on March 24, 1999 after submitting the Phase 2 Report and on August 17, 2000 and September 6, 2000 after submitting the initial version of the Final RFI Report. During the March 24, 1999 discussion, USEPA concurred with Bayer that no further

action is required for this SWMU, pending inclusion of this area in an institutional control plan for the protection of workers while excavating based on the 2,4-TDA identified in subsurface samples. Additionally, it was agreed that four discrete samples were to be collected during Phase 3 and analyzed for 2,4-TDA.

During the August 17, 2000 discussion, the analytical data and text presented in the initial submittal of the Final RFI Report were reviewed. USEPA requested further clarification on the methylene chloride detected at 700 ug/kg and modified as being detected in the blank. Methylene chloride was the only constituent exceeding the site specific SSLs. During the September 6, 2000 discussion, IT indicated that methylene chloride (a common laboratory contaminant) was also detected in the method blank at a concentration of 700 ug/kg. Additionally, historical groundwater analytical data for the SWMU 30 area were reviewed and methylene chloride was not identified in groundwater in the SWMU 30 area, supporting the belief that the methylene chloride is most likely associated with sampling or laboratory contamination. Although USEPA generally agreed with this belief, it was agreed that it would be prudent to include this area in the institutional control plan due to the potential presence of methylene chloride. If subsurface work is done in SWMU 30, it was agreed that soil samples would be collected and analyzed for methylene chloride. If methylene chloride is not identified, it could be removed as a constituent of interest for this SWMU in the institutional control plan. However, until the methylene chloride issue is further defined, a soil management plan for SWMU 30 will be implemented with an action level of 400 ug/kg for methylene chloride.

USEPA also asked for statistics (mean, median, 95% UCL) to be calculated for 2,4-TDA (Table 4.21-4). Based on the review of the 2,4-TDA results, USEPA confirmed the previous decision that SWMU 30 should be included in the facility's institutional control plan for subsurface work.

4.21.5 Conclusions and Recommendations

The only constituent with a maximum detection that exceeds the industrial RBC is 2,4-toluenediamine. This constituent was detected in only 3 subsurface samples and is related to samples containing TDI residue, which is readily discernable lustrous, brown-black solid. All of these samples were collected from the subsurface. Therefore, there is no concern related to the direct soil contact pathways. All detection limits for undetected constituents are considered reasonable and are not elevated.

Comparison of the soil analytical data to the site-specific SSLs indicates that only methylene chloride, a common blank contaminant, has a maximum detection that exceeds the site-specific SSL. Therefore, there is no concern related to migration of detected constituents from soil to groundwater at this SWMU. Methylene chloride has not been detected in groundwater samples collected in the vicinity of this SWMU. —Based on discussions with USEPA, Bayer has agreed to include the SWMA in a soil management plan for methylene chloride. More specifically, soil excavated from this area will be sampled and analyzed for methylene chloride. If methylene chloride exceeds 400 ug/kg, the removed soil will be properly disposed in accordance with applicable regulations. If sampling confirms that additional methylene chloride is a result of blank contamination, USEPA will be notified and a request to remove SWMA 30 from the soil management plan will be issued.

As a result, no further action is warranted for SWMU 30. During a March 24, 1999 conference call, USEPA concurred with the no further action decision pending inclusion of this SWMU in an institutional control plan for workers that may be exposed to subsurface soils containing 2,4-toluenediamine. Bayer has agreed to include this SWMU in an institutional control plan for protection of workers performing subsurface work.

Section 8

Updated based on report modifications.

8.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

8.1 SUMMARY

Bayer Corporation (Bayer) has conducted a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at their New Martinsville, West Virginia facility. The RFI was completed in accordance with the requirements in the facility's RCRA permit for Corrective Action and Waste Minimization (WVD 05 686 6312). A total of 30 solid waste management units (SWMUs) were investigated as part of the RFI. The overall objectives of the RFI included the following:

- Characterize the soils in the vicinity of each SWMU
- Define the nature and extent of constituents in soils which may pose a human health and/or ecological risk
- Assess risks to human health and the environment based on chemical data from each SWMU
- Identify SWMUs which require a corrective measure study (CMS), based on identified risks.

The media potentially affected by releases at the site and evaluated in the RFI include soil, surface water, and groundwater sediments.

The conclusions and recommendations presented in this report are based on the combined results of all three RFI Phases. Soils were investigated on a SWMU basis during Phases 1 and 2 of the RFI and groups of SWMUs in Phase 3 of the RFI. The SWMUs were grouped on proximity, historical knowledge, and analytical results. Soil conditions at the SWMUs were characterized through:

- Collection of more than 1,700 EM readings
- GPR surveys in 4 SWMUs
- Collection of approximately 800 soil gas samples
- Installation of approximately 200 test borings
- Collection and laboratory analyses of approximately 300 soil samples

Human health risk was a critical component in the interpretation of soil, surface water and sediment data and in the RFI decision-making process. The primary purpose of the risk assessment at the Bayer facility was to decide the appropriate corrective action to take, if any, for

soil at each SWMU or SWMU group. The risk assessment considered both residential and industrial land use. However, because Bayer is an active industrial facility and has formally applied for industrial land use, all recommendations for corrective action were based on the assumption of future industrial land use.

A screening level groundwater risk evaluation was performed by comparing 1998 quarterly groundwater monitoring data to established water quality criteria.

8.2 Conclusions

The RFI has provided the data needed to define surface and subsurface conditions, nature and extent of constituents, potential risks to human health and the environment, and the appropriate action for soils at each of the 14 individual SWMUs and 5 SWMU groups. Table 8-1 provides a summary of the status of each SWMU or SWMU group relative to the need for further action.

As indicated in Table 8-1, the RFI data for the 14 individual SWMUs were discussed in detail via telephone conference calls with USEPA following submittal of the Phase 2 Technical Memorandum. These tables reflect the results of the discussions with USEPA. The 14 individual SWMUs required no further investigation and were placed in the no further action category (NFA). However, institutional controls to protect workers from potential exposure to subsurface soils are required at the following SWMUs: SWMU 13, SWMU 18, SWMU 19, SWMU 22, SWMU 25, and SWMU 30,

Surface water and sediments of Beaver Run were also placed in the no further evaluation and no further action category following the submission of the Phase 2 Technical Memorandum and subsequent discussions with USEPA.

Bayer has concluded that SWMUs 21, 22 and the remaining 4 SWMU Groups, which include 14 of the original 30 SWMUs, that were evaluated further during Phase 3 require no further action for reasons summarized in Section 4 of this report. Bayer is willing to discuss the rationale for each SWMU group in detail with USEPA Region III, similar to the process used following the submission of the Phase 2 Technical Memorandum. Bayer has also recommended institutional controls at each of the SWMUs and SWMU groups evaluated during Phase 3. Concerns associated with potential leaching to groundwater from these SWMUs will be evaluated as part of the groundwater CMS.

8.3 Recommendations

Based on the RFI findings all 30 of the SWMUs are recommended for no further action for the direct exposure pathway. This included 14 of the SWMUs discussed in detail with USEPA following Phase 2 of the RFI, SWMUs 21 and 22, and the 4 SWMU Groups, which included 14 of the remaining 16 SWMUs, evaluated in Phase 3.

Due to potential concerns with subsurface soils, SWMU Groups A through D and SWMU 30 will be included in an institutional control plan covering subsurface work;. A soil management plan will be included in the institutional control requirements for SWMU 30.

A groundwater CMS is recommended to evaluate technologies to expedite restoration of groundwater quality. As indicated in Section 4 of this report, this may include addressing potential leaching to groundwater associated with some of the Phase 3 SWMUs/SWMU groups.

To reduce infiltration of precipitation, an engineered soil cover with permeability requirements is recommended as a presumptive remedy for SWMU Group A.

Appendix F

Added discussion of detection limit evaluation performed based on teleconference calls with USEPA.

Appendix F

F.1 Uncertainties Discussion

There is some uncertainty in not quantifying the potential risks and hazards associated with constituents that had detection limits, but not detections, that exceeded industrial RBCs (Sections 4.2.3.1, 4.3.3.1, 4.4.3.1, 4.5.3.1, and 4.6.3.1). To evaluate the issue of detection limits further, the following sections present the frequency of detection limit exceedences for each of the SWMU Group constituents that had detection limit exceedences. In addition, statistical information (such as arithmetic mean data for nondetect constituents) has been added for some of the SWMUs per a request from USEPA. It should be noted that both (1) the number of samples with detection limits that exceed the RBC and (2) the number of samples with one-half of the detection limit that exceed the RBC are presented for the 0-5 foot soil data set. The use of one-half detection limit information in these sections is important because risk assessments typically use one-half of the analytical detection limit when calculating exposure point concentrations.

F.1.1 SWMU Group A

For SWMU Group A, seven constituents (3,3-dichlorobenzidine, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis(2-chloroethyl)ether, indeno(1,2,3-cd)pyrene, and o,p-toluidine) were detected at least once in site-wide soils at any depth, and some of their detection limits at SWMU Group A exceeded their respective Region III industrial RBCs. These constituents are evaluated in the following table.

Constituent	Industrial RBC (mg/kg)	Sample Size	Number of Detection Limits That Exceed RBC	Number of 1/2- Detection Limits That Exceed RBC	Exceedence Frequency	
					Using Detection Limits	Using 1/2- Detection Limits
3,3-dichlorobenzidine	12.7	26	9	1	34.6%	3.8%
Benzo(a)anthracene	7.84	26	1	0	3.8%	0.0%
Benzo(a)pyrene	0.784	26	10	10	38.5%	38.5%
Benzo(b)fluoranthene	7.84	26	1	0	3.8%	0.0%
Bis(2-chloroethyl)ether	5.2	26	1	1	3.8%	3.8%
Indeno(1,2,3-cd)pyrene	7.84	26	1	0	3.8%	0.0%
o,p-toluidine	30	26	1	0	3.8%	0.0%

As can be seen in the table above, benzo[a]pyrene has significantly more than 10 to 15 percent of its samples with 1/2 detection limits that exceed the RBC. Thus, if this constituent were present at one-half of the detection limit in each sample, it is possible that the resulting exposure point concentrations could be associated with an unacceptable risk or hazard for either of the two receptors. However, it is not known whether or not this constituent is actually present at elevated levels at SWMU Group A, and it is reasonable to assume that the conservatisms inherent in the risk assessment process compensate for the uncertainties discussed herein.

F.1.2 SWMU Group B

For SWMU Group B, nine constituents (3,3-dichlorobenzidine, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis(2-chloroethyl)ether, indeno(1,2,3-cd)pyrene, 1,2-dibromo-3-chloropropane, m-toluidine and o,p-toluidine) were detected at least once in site-wide soils at any depth, and some of their detection limits at SWMU Group B exceeded their respective Region III industrial RBCs. These constituents are evaluated in the following table.

Constituent	Industrial RBC (mg/kg)	Sample Size	Number of Detection Limits That Exceed RBC	Number of 1/2-Detection Limits That Exceed RBC	Exceedence Frequency	
					Using Detection Limits	Using 1/2- Detection Limits
3,3-dichlorobenzidine	12.7	23	18	4	78.3%	17.4%
Benzo(a)anthracene	7.84	23	3	1	13.0%	4.3%
Benzo(a)pyrene	0.784	23	18	18	78.3%	78.3%
Benzo(b)fluoranthene	7.84	23	3	1	13.0%	4.3%
Bis(2-chloroethyl)ether	5.2	23	3	3	13.0%	13.0%
Indeno(1,2,3-cd)pyrene	7.84	23	3	1	13.0%	4.3%
1,2-dibromo-3-chloropropane	4.1	32	1	0	3.1%	0.0%
m-toluidine	30	23	1	0	4.3%	0.0%
o,p-toluidine	30	23	3	2	13.0%	8.7%

As can be seen in the table above, benzo[a]pyrene has significantly more than 10 to 15 percent of its samples with 1/2 detection limits that exceed the RBC. Thus, if this constituent were present at one-half of the detection limit in each sample, it is possible that the resulting exposure point concentration could be associated with an unacceptable risk or hazard for either of the two receptors. However, it is not known whether or not this constituent is actually present at elevated levels at SWMU Group B, and it is reasonable to assume that the conservatisms inherent in the risk assessment process compensate for the uncertainties discussed herein.

At the request of USEPA, a statistical analysis of the detection limits for constituents of potential concern was performed based on the findings of the 0-2 ft bgs and 0-5 ft bgs soil screening tables. These analyses included mean, median, maximum, minimum, standard deviation, and industrial RBC values for non-detected constituents. An evaluation indicated that the mean detection limits for most of the constituents in the 0-2 ft bgs screening table were two to three times the industrial RBCs, with the exception of benzidine that showed much greater excursions above the RBC. This indicates that the detection limits are elevated or the RBCs are relatively low. It should be noted that benzidine is not found anywhere onsite and is not believed to have been used on the site. Based on the findings of the statistical analysis, USEPA indicated in a conference call on August 14, 2000 that the detection limits did not appear very elevated, were not atypical for the classes of constituents evaluated, and did not indicate poor laboratory work. USEPA indicated they were satisfied with what had been presented in the statistical analysis of detection limits, and that there was not a problem with the non-detected data and the detection limits. USEPA also indicated that the analysis of detection limits for SWMU Group B non-detected constituents should suffice for discussions of the remaining SWMUs.

F.1.3 SWMU Group C

For SWMU Group C, seven constituents (3,3-dichlorobenzidine, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis(2-chloroethyl)ether, indeno(1,2,3-cd)pyrene, and o,p-toluidine) were detected at least once in site-wide soils at any depth, and some of their detection limits at SWMU Group C exceeded their respective Region III industrial RBCs. These constituents are evaluated in the following table.

Constituent	Industrial RBC (mg/kg)	Sample Size	Number of Detection Limits That Exceed RBC	Number of 1/2- Detection Limits That Exceed RBC	Exceedence Frequency	
					Using Detection Limits	Using 1/2- Detection Limits
3,3-dichlorobenzidine	12.7	28	22	3	78.6%	10.7%
Benzo(a)anthracene	7.84	28	2	0	7.1%	0.0%
Benzo(a)pyrene	0.784	28	24	24	85.7%	85.7%
Benzo(b)fluoranthene	7.84	28	2	0	7.1%	0.0%
Bis(2-chloroethyl)ether	5.2	28	2	2	7.1%	7.1%
Indeno(1,2,3-cd)pyrene	7.84	28	2	1	7.1%	3.6%
o,p-toluidine	30	28	1	0	3.6%	0.0%

As can be seen in the table above, one constituent (benzo[a]pyrene) has significantly more than 10 to 15 percent of its samples with 1/2 detection limits that exceed the RBC. Thus, if this constituent was present

at one-half of the detection limit in each sample, it is possible that the resulting exposure point concentrations could be associated with an unacceptable risk or hazard for either of the two receptors. However, it is not known whether or not this constituent is actually present at SWMU Group C, and it is reasonable to assume that the conservatisms inherent in the risk assessment process compensate for the uncertainties discussed herein.

F.1.4 SWMU Group D

For SWMU Group D, six constituents (3,3-dichlorobenzidine, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis(2-chloroethyl)ether, and indeno(1,2,3-cd)pyrene) were detected at least once in site-wide soils at any depth, and some of their detection limits at SWMU Group D exceeded their respective Region III industrial RBCs. These constituents are evaluated in the following table.

Constituent	Industrial RBC (mg/kg)	Sample Size	Number of Detection Limits That Exceed RBC	Number of 1/2- Detection Limits That Exceed RBC	Exceedence Frequency	
					Using Detection Limits	Using 1/2- Detection Limits
3,3-dichlorobenzidine	12.7	56	21	5	37.5%	8.9%
Benzo(a)anthracene	7.84	56	5	2	8.9%	3.6%
Benzo(a)pyrene	0.784	56	24	21	42.9%	37.5%
Benzo(b)fluoranthene	7.84	56	5	0	8.9%	0.0%
Bis(2-chloroethyl)ether	5.2	56	5	5	8.9%	8.9%
Indeno(1,2,3-cd)pyrene	7.84	56	5	0	8.9%	0.0%

As can be seen in the table above, one constituent (benzo[a]pyrene) has significantly more than 10 to 15 percent of its samples with 1/2 detection limits that exceed the RBC. Thus, if this constituent was present at one-half of the detection limit in each sample, it is possible that the resulting exposure point concentrations could be associated with an unacceptable risk or hazard for either of the two receptors. However, it is not known whether or not this constituent is actually present at SWMU Group D, and it is reasonable to assume that the conservatisms inherent in the risk assessment process compensate for the uncertainties discussed herein.

At the request of USEPA, a statistical analysis of the detection limits for constituents of potential concern was performed based on the findings of the 0-2 ft bgs and 0-5 ft bgs soil screening tables. These analyses included mean, median, maximum, minimum, standard deviation, and industrial RBC values for non-detected constituents. An evaluation indicated that four constituents had both a median and mean

concentration above the industrial RBC (e.g., 1,2-dibromoethane, 2,4-TDA, benzidine, and n-nitrosodimethylamine), whereas three constituents had a mean, but not a median concentration above the industrial RBC (e.g., benzo[a]pyrene, dibenzo[a,h]anthracene, and n-nitrosodipropylamine). This indicates that the detection limits are elevated or the RBCs are relatively low. It should be noted that benzidine is not found anywhere onsite and is not believed to have been used on the site. Based on the findings of the statistical analysis, USEPA indicated in a conference call on September 6, 2000 that the detection limits did not appear very elevated, were not atypical for the classes of constituents evaluated, and did not indicate poor laboratory work. USEPA indicated they were satisfied with what had been presented in the statistical analysis of detection limits, and that there was not a problem with the non-detected data and the detection limits.

F.1.5 SWMU 21

For SWMU 21, eight constituents (3,3-dichlorobenzidine, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis(2-chloroethyl)ether, indeno(1,2,3-cd)pyrene, n-nitroso-dibutylamine, and o,p-toluidine) were detected at least once in site-wide soils at any depth, and some of their detection limits at SWMU 21 exceeded their respective Region III industrial RBCs. These constituents are evaluated in the following table.

Constituent	Industrial RBC (mg/kg)	Sample Size	Number of Detection Limits That Exceed RBC	Number of 1/2- Detection Limits That Exceed RBC	Exceedence Frequency	
					Using Detection Limits	Using 1/2- Detection Limits
3,3-dichlorobenzidine	12.7	8	3	3	37.5%	37.5%
Benzo(a)anthracene	7.84	8	3	1	37.5%	12.5%
Benzo(a)pyrene	0.784	8	4	4	50.0%	50.0%
Benzo(b)fluoranthene	7.84	8	3	1	37.5%	12.5%
Bis(2-chloroethyl)ether	5.2	8	3	1	37.5%	12.5%
Indeno(1,2,3-cd)pyrene	7.84	8	3	1	37.5%	12.5%
N-nitroso-dibutylamine	1.1	8	4	3	50.0%	37.5%
o,p-toluidine	30	8	3	1	37.5%	12.5%

As can be seen in the table above, two constituents (benzo[a]pyrene and n-nitroso-dibutylamine) have significantly more than 10 percent of their samples with 1/2 detection limits that exceed the RBC. Thus, if these constituents were present at one-half of the detection limit in each sample, it is possible that the resulting exposure point concentrations could be associated with an unacceptable risk or hazard for either

of the two receptors. However, it is not known whether or not these constituents are actually present at SWMU 21, and it is reasonable to assume that the conservatisms inherent in the risk assessment process compensate for the uncertainties discussed herein.

F.1.6 SWMU 27

For SWMU 27, eight constituents (3,3-dichlorobenzidine, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis(2-chloroethyl)ether, indeno(1,2,3-cd)pyrene, n-nitroso-dibutylamine, and o,p-toluidine) were detected at least once in site-wide soils at any depth, and some of their detection limits at SWMU Group B exceeded their respective Region III industrial RBCs. These constituents are evaluated in the following table.

Constituent	Industrial RBC (mg/kg)	Sample Size	Number of Detection Limits That Exceed RBC	Number of 1/2- Detection Limits That Exceed RBC	Exceedence Frequency	
					Using Detection Limits	Using 1/2- Detection Limits
3,3-dichlorobenzidine	12.7	24	11	6	45.8%	25.0%
Benzo(a)anthracene	7.84	24	5	5	20.8%	20.8%
Benzo(a)pyrene	0.784	24	14	11	58.3%	45.8%
Benzo(b)fluoranthene	7.84	24	5	5	20.8%	20.8%
Bis(2-chloroethyl)ether	5.2	24	5	5	20.8%	20.8%
Indeno(1,2,3-cd)pyrene	7.84	24	5	5	20.8%	20.8%
N-nitroso-dibutylamine	1.1	24	14	10	58.3%	41.7%
o,p-toluidine	30	24	5	5	20.8%	20.8%

As can be seen in the table above, two constituents (benzo[a]pyrene and n-nitroso-dibutylamine) have significantly more than 10 percent of their samples with 1/2 detection limits that exceed the RBC. Thus, if these constituents were present at one-half of the detection limit in each sample, it is possible that the resulting exposure point concentrations could be associated with an unacceptable risk or hazard for either of the two receptors. However, it is not known whether or not these constituents are actually present at SWMU 27, and it is reasonable to assume that the conservatisms inherent in the risk assessment process compensate for the uncertainties discussed herein.

F.1.7 Uncertainty Conclusions

Only one constituent (benzo[a]pyrene) consistently shows up in each SWMU group with more than 10 to 15 percent of the sample detection limits exceeding twice the industrial RBC (or stated another way, with more than 10 to 15 percent of 1/2 of the detection limits exceeding the industrial RBC). This finding is

primarily related to the very low RBC threshold of 0.784 mg/kg. To get some idea of the probability of benzo(a)pyrene actually being present at any of the five SWMUs, site-wide data on this PAH were compiled. Out of approximately 600 site-wide samples for benzo(a)pyrene, this PAH was detected fourteen times, resulting in a site-wide frequency of occurrence of about 2 percent. The highest detection was 22.7 mg/kg at sample SM006-TB03-1719. The next highest detection was at 14.9 mg/kg at sample SM007-TB03-1315. Neither of these two samples are within the 0-5 foot depth interval. Out of the fourteen site-wide benzo(a)pyrene detections, only 6 exceeded the industrial RBC (i.e., less than 2 percent of the samples). This suggests benzo(a)pyrene is not very common at the site, and would not be expected at any of the SWMU Groups. It should also be noted that benzo(a)pyrene is generally ubiquitous in the environment at low concentrations, with typical background concentrations as follows (from ATSDR, 1995):

- Rural Soils 0.002 – 1.3 mg/kg
- Agricultural Soils 0.0046 – 0.9 mg/kg
- Urban Soils 0.165 – 0.22 mg/kg

These findings suggest that benzo(a)pyrene's detection limit exceedences are not necessarily a significant problem at SWMU Groups A, B, C, D, and E.

Another constituent, 3,3-dichlorobenzidine, had detection limits exceeding twice the industrial RBC at a frequency of more than 15 percent in samples from SWMU Groups B and E. The constituent, 3,3-dichlorobenzidine, was detected extremely infrequently site-wide. It was detected in only one sample (SM-019-TB02-1820) out of approximately 600 total samples, at a concentration of 15.1 mg/kg. The positive detection was not in the 0 to 5 feet zone. This low detection frequency (less than one percent) strongly suggests that 3,3-dichlorobenzidine is not present at these SWMUs, and the detection limit exceedences are not a significant concern.